Regarding "Prediction of 6-minute walk performance in patients with peripheral artery disease"

We read with much interest the article by Chen et al[1] entitled "Prediction of 6-minute walk performance in patients with peripheral artery disease" that was published in the *Journal of Vascular Surgery* in October 2017. The aim of this research was to develop a statistical model to predict 6-minute walk test (6MWT) gait speed from 4-meter walk test results and clinical characteristics among patients with peripheral artery disease. Finally, the authors mentioned that the variables of slower 4-meter walking speed, lower ankle-brachial index, and presence of dyspnea all predict slower 6MWT gait speed, which corresponds to shorter 6MWT distance. Prediction of group means is reasonably precise; however, prediction of individual patient 6MWT performance is imprecise relative to between-group differences that are clinically important.[1] Although this research was valuable and the results are interesting, we think that some methodologic issues should be considered to avoid misinterpretation.

1. Regardless of the results of this study, the accuracy of predictors or determinants of dependent variables cannot be identified and guaranteed by cross-sectional studies; the predictors should be identified by cohort studies.[2-4] In other words, prediction or causal inferences cannot be guaranteed by cross-sectional study because the independent and dependent variables are measured at a time point. Without the temporality assumption (the dependent variable has to occur after the independent variable) and time consequence, we are not able to identify the cause and effect.[5] In other words, the longitudinal studies are essential for determination of independent predictors of outcome.
2. The internal and external validation of the prediction model must be done through bootstrapping and split-validation, respectively.[6] Therefore, according to the preceding explanation, it is necessary considering to this point in interpretation of results of this study for readers.

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Reply

We would like to thank Drs Hanis and Mansori for their interest in our recently published paper entitled "Prediction of 6-minute walk performance in patients with peripheral artery disease."[1] This letter is in response to their letter, which offers two suggestions regarding alternative design and statistical analysis approaches.

Their first suggestion is to use a longitudinal cohort study to serve as the basis of the predictive model. Although a longitudinal design is preferred when using "baseline" characteristics to predict change in outcome measurements and incidence of comorbid conditions, our objective is different. Our aim was to use patient characteristics and the 4-meter walk test measurements to predict 6-meter walk performance at the same time point (ie, during the baseline visit). In this case, a longitudinal design is not preferred because we are predicting an outcome measure at the same clinical baseline visit. Our cross-sectional design is appropriate to determine if clinicians can use a less time-consuming walk test, the 4-meter walk test, to predict the concurrent 6-minute walk test performance of symptomatic patients with peripheral artery disease rather than to predict their performance in future clinic visits.

The second suggestion raised by Drs Hanis and Mansori relates to approaches for validating the predictive model. We agree that validation of predictive models is important for evaluating utility of the models in clinical